REMARKS/ARGUMENTS

The Examiner rejects claims 1-9 and 21-22 and 10-20 and 24-25 under 35 U.S.C.§103(a) as being unpatentable over Bailey et al. (U.S. 4,152,758) and alternatively under 35 U.S.C.§103(a) as being unpatentable over Bailey et al. in view of Smith et al. (U.S. 6,367,891). Regarding the rejection of claims 1-9, 21-22, 10-20, and 24-25, the Examiner takes the position that Fig. 3A of Bailey et al. teaches that a locomotive can have a plurality of motors, each having a corresponding drive switch and a free-wheeling bypass circuit.

Applicant respectfully traverses the Examiner's rejections. The cited references fail to teach or suggest at least the following italicized language of the independent claims.

> 1. A locomotive, comprising:
> a plurality of direct current traction motors corresponding to a plurality of axles and a plurality of drive switches;
> a plurality of free-wheeling bypass circuits, each bypass circuit bypassing a corresponding one of the plurality of plurality of drive switches; and
> *a controller operable to (a) determine the power requirement for each motor at each of a number of successive time intervals; (b) determine the necessary voltage and pulse width to achieve the desired power for each motor; and (c) sequentially pulse power to each of the motors for a duration necessary to achieve the power requirement at each successive time interval, wherein, during a selected time interval, a first traction motor receives a first power pulse and a second different traction motor receives a second power pulse and wherein the first and second power pulses are different.*

> 10. A method for operating a locomotive, comprising:
> providing a plurality of direct current traction motors corresponding to a plurality of axles and at least one chopper circuit, the at least one chopper circuit comprising a corresponding drive circuit, the drive circuit including a corresponding drive switch and being in electrical communication with a corresponding one or more of the plurality of traction motors, and a corresponding free-wheeling bypass circuit, the bypass circuit bypassing the corresponding drive switch, wherein, in a first mode, at least most of the electrical current passing through the corresponding chopper circuit passes through the corresponding free-wheeling bypass circuit and

> corresponding one or more of the plurality of traction motors and bypasses the corresponding drive switch and, in a second mode, at least most of the electrical current passing through the corresponding chopper circuit passes through the corresponding drive switch and the corresponding one or more traction motors and bypasses the corresponding free-wheeling bypass circuit; and
>
> *simultaneously operating at least one of the traction motors in the first mode and a different at least one of the traction motors in the second mode.*

Bailey et al.

Bailey et al. teaches a means of assuring that a chopper circuit remains in a desired state (either conducting or freewheeling) under various load conditions, especially light load conditions. Figure 3a depicts a single traction motor to illustrate the operation of the rectifier circuit, which provides power conversion from alternating to direct current. The rectifier circuit is phase controlled so that electric valves in the circuit are provided with firing signals when the valves are forward biased. The circuit is intended to address the following problem:

> In operation, such a valve [in the rectifier] has a non-conducting or blocking state, in which it presents very high impedance to the flow of current, and a conducting or turned-on state in which it freely conducts forward current with only a relatively slight voltage drop. It can be switched abruptly from the former state to the latter by the concurrence of a forward bias on its main electrodes (anode at a positive potential with respect to cathode) and a control or trigger signal on its gate. The time at which the valve is turned on, measured in electrical degrees from a cyclically recurring instant at which its anode voltage first becomes positive with respect to its cathode, is known as the "firing angle". The magnitude of the output voltage of the rectifier circuit can be varied by retarding or advancing the firing angle as desired.

(Col. 1, lines 27-41.) An advancing firing angle can result in a firing pulse occurring at a time at which the valves in the phase-controlled rectifier circuit are reverse biased. Thus, the DC voltage cannot be built-up from a light load condition. (Col. 2, lines 11-15.)

The problem is addressed in Bailey et al. by a comparison module that compares the DC voltage at the DC terminals of the rectifier circuit to a reference voltage. The module provides a voltage signal whose amplitude is representative of the sum of the magnitude of the reference signal and the difference in magnitude between the reference signal and the DC terminal voltage. The voltage signal is compared with a ramp function signal which is synchronized to the AC input voltage. The latter comparison produces a valve firing signal when the magnitude of the ramp function signal crosses the magnitude of the voltage signal. To assure that the valve is triggered, the comparison module compares the DC terminal voltage to the AC terminal voltage and generates a re-firing signal when the AC voltage magnitude becomes greater than the DC voltage magnitude.

Although Bailey et al. teaches a chopper circuit in the regulator circuit 26, the various operational modes taught in Bailey et al. are directed to the control pulses to the phased control rectifier system and not to the chopper circuit itself. Moreover, Fig. 3A depicts a single motor circuit. Bailey et al. does not teach or suggest the use of a plurality of motors, each having its own circuit.

The Examiner's statement that "because the locomotive has a plurality of traction motors, each motor has its own chopper circuit, therefore there are plurality of chopper circuits" does not necessarily follow. Locomotives having only one chopper circuit driving a plurality of traction motors are well known and in widespread use.

The Examiner's reliance on the voltage controller 38 as being the same as the controller of the pending claims is misplaced. While the controller of the pending claims controls the power supplied to each traction motor by controlling power pulses provided by the chopper circuit, the voltage controller 38 of Figure 1 of Bailey et al. controls the power pulses provided to the

comparator 36, NAND gate 40, pulse shaper 42, and thyristor firing circuit 44, which in turn provides firing signals to the phase controlled rectifier 18. It does not control the current regulator 26 (which includes the chopper circuit).

Smith et al.

Smith et al. is directed to an apparatus for determining the direction of locomotive travel while in dynamic braking. The direction of travel of derived from current sensors associated with the locomotive traction motors. When in the dynamic braking mode, current flows through the current sensors in a first direction when the train is traveling in the first direction and reverses the direction of flow when the train is traveling in a second direction.

Smith et al. teaches neither the use of a chopper circuit on each traction motor nor the independent control of the individual traction motors.

Personal Knowledge of Examiner

At page 6 of the Office Action, the Examiner states that "it is well known in the art that when two traction motors having different speed, then the higher speed motor should be temporarily switched off so that the second motor can catch up its speed." The Examiner, however, fails to cite a specific reference for this teaching. He used this teaching to reject the subject matter of claims 6 and 7, which have been incorporated into claim 1. Claim 6 was directed to a controller operable to (a) determine the power requirement for each motor at each of a number of successive time intervals; (b) determine the necessary voltage and pulse width to achieve the desired power for each motor; and (c) sequentially pulse power to each of the motors for a duration necessary to achieve the power requirement at each successive time interval. Claim 7 was directed to the subject matter of claim 6

wherein, during a selected time interval, a first traction motor receives a first power pulse and a second different traction receives a second power pulse and wherein the first and second power pulses have differing magnitudes. At page 6 of the Office Actioon, the Examiner's statement that "Claims . . . 7-9 . . . are claiming no more than such a situation [mentioned above]" ignores the specific limitations of the claims. The Examiner must address each of the limitations of the rejected claims. *In re Thrift*, 63 USPQ2d 2002, 2006 (Fed. Cir. 2002) (Board of Patent Appeals decision overturned where the Board sustained the examiner's very general and broad conclusion of obviousness based on his finding that "[t]he use of grammar is old and well known in the art of speech recognition as a means of optimization which is highly desirable" and the statement failed to address the grammar-creation capability limitations of the rejected claim). To the extent that the Examiner continues to rely on his personal knowledge of the prior art, Applicant hereby requests, under 37 CFR§1.104, an affidavit of the Examiner providing the specific teachings of any such prior art. Applicants wish to avail themselves of their right to contradict and/or explain such prior art by the affidavits of applicants and/or other persons.

Accordingly, the pending claims are allowable.

The dependent claims provide additional reasons for allowance.

By way of example, dependent claims 8 and 15 provide that the first and second power pulses are nonoverlapping.

In addition, the Examiner has issued a Restriction Requirement. The claims have been restricted as follows:

Group I: Claims 1-26, drawn to locomotive motor power control with free-wheeling diode; and

Group II: Claims 27-37, drawn to locomotive wheel slip control.

Applicants hereby elect to prosecute the claims of Group I and have canceled the claims of Group II.

Applicants have added new claims 38-51. Independent claim 38 is a combination of independent claim 1, intervening dependent claim 21, and allowable dependent claim 23, and independent claim 43 is a combination of independent claim 10, intervening dependent claims 24-25, and allowable dependent claim 26. Accordingly, the newly added claims are allowable.

Applicant wishes to clarify the intended meaning of certain claim language in light of the Federal Circuit decision "SuperGuide Corporation v. DirecTV Enterprises, Inc., et al., 358 F.3d 870 (Fed. Cir. 2004). In that decision, the Federal Circuit held, under the unique facts of that case, that the phrase "at least one of a desired program start time, a desired program end time, a desired program service, and a desired program type" means "at least one of a desired program start time, at least one of a desired program end time, at least one of a desired program service, and at least one of a desired program type".

Applicant has used the phrases "at least one of . . . and" and "one or more of . . . and" in a number of claims and wishes to clarify to the Examiner the proper construction of this phrase. Applicant intended the phrases "at least one . . and" and "one or more of . . . and" as used in the claims to be an open-ended expression that is both conjunctive and disjunctive in operation. For example, the expressions "at least one of A, B and C" and "one or more of A, B, and C" mean A

alone, B alone, C alone, A and B together, A and C together, B and C together, and A, B and C together. Applicant believes that this construction is consistent with the Examiner's construction of the claims in the Office Action. If the Examiner disagrees with this construction, Applicant respectfully requests that the Examiner notify Applicant accordingly so that Applicant can further amend the claims.

Based upon the foregoing, Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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AMENDMENTS TO THE DRAWINGS

The attached sheets of drawings includes changes to Figs. 1-3, 15, 16a, 16b, 21, 22a, 22b, 23a, 23b, and 24. These sheets, which include Figs. 1-3, 15, 16a, 16b, 21, 22a, 22b, 23a, 23b, and 24, replace the original sheets including Figs. 1-3, 15, 16a, 16b, 21, 22a, 22b, 23a, 23b, and 24.

Attachment: Replacement Sheets
Annotated Sheets Showing Changes

Annotated Sheet Showing Changes

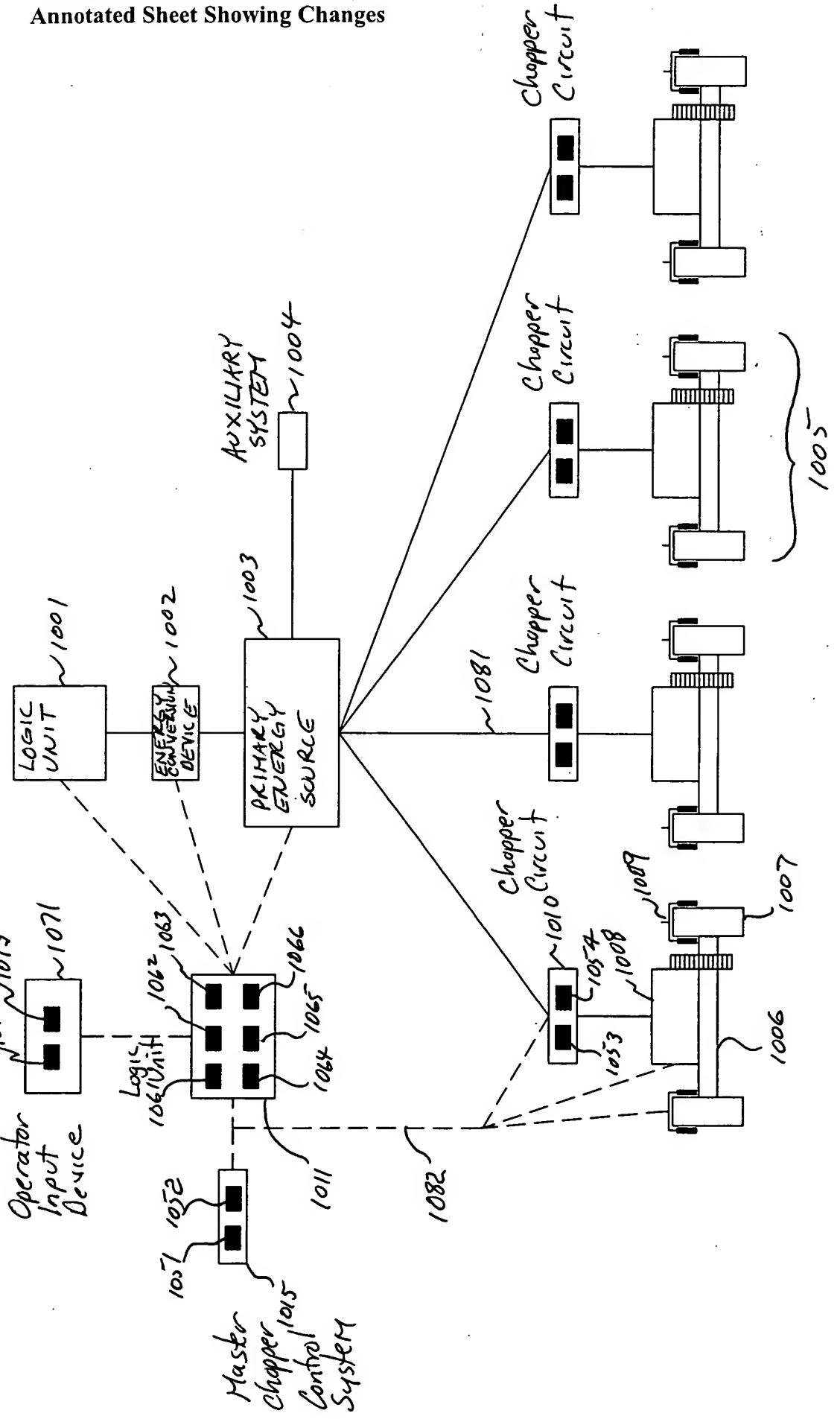

FIG. 1

Annotated Sheet Showing Changes

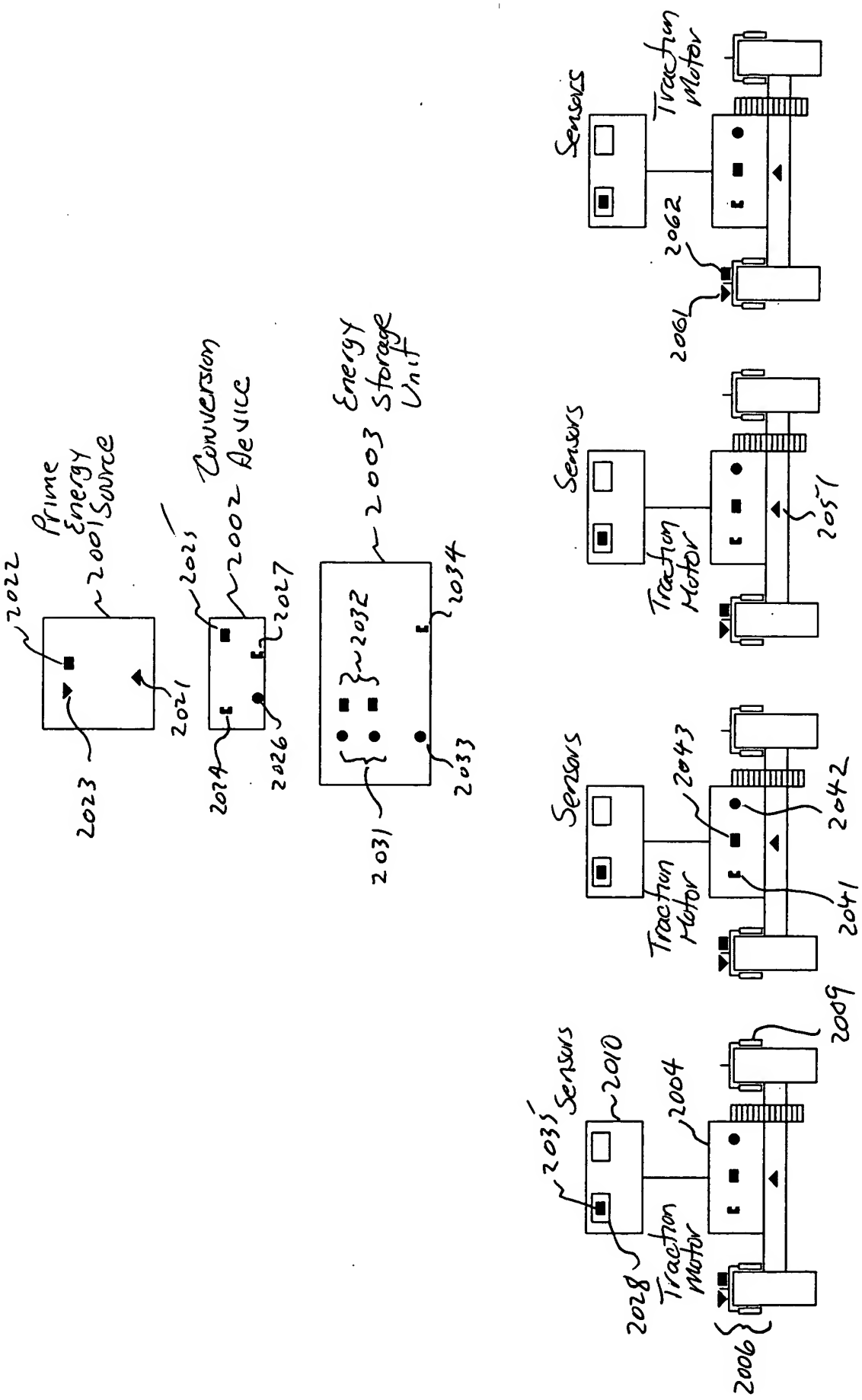

FIG. 2

Annotated Sheet Showing Changes

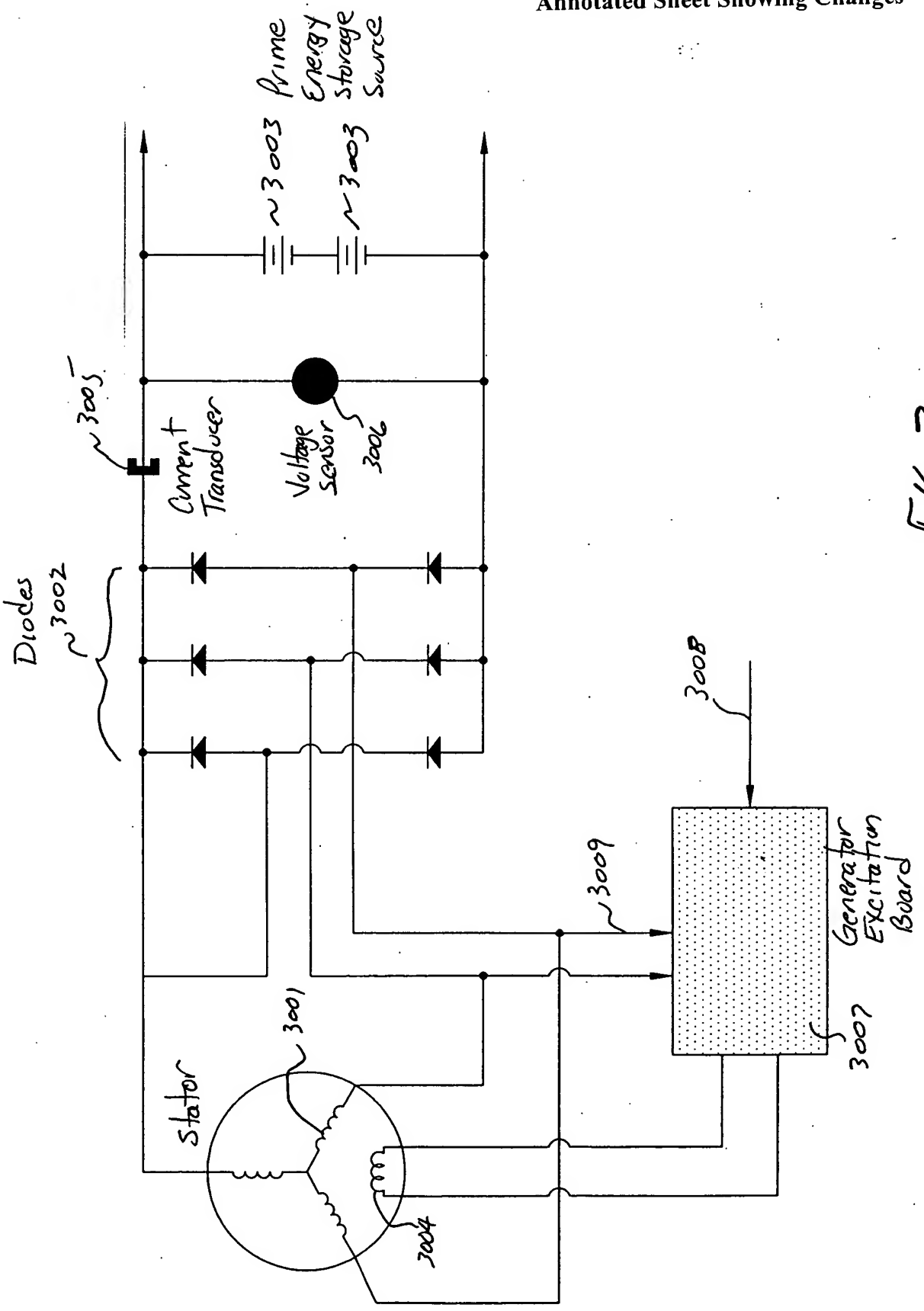

FIG. 3

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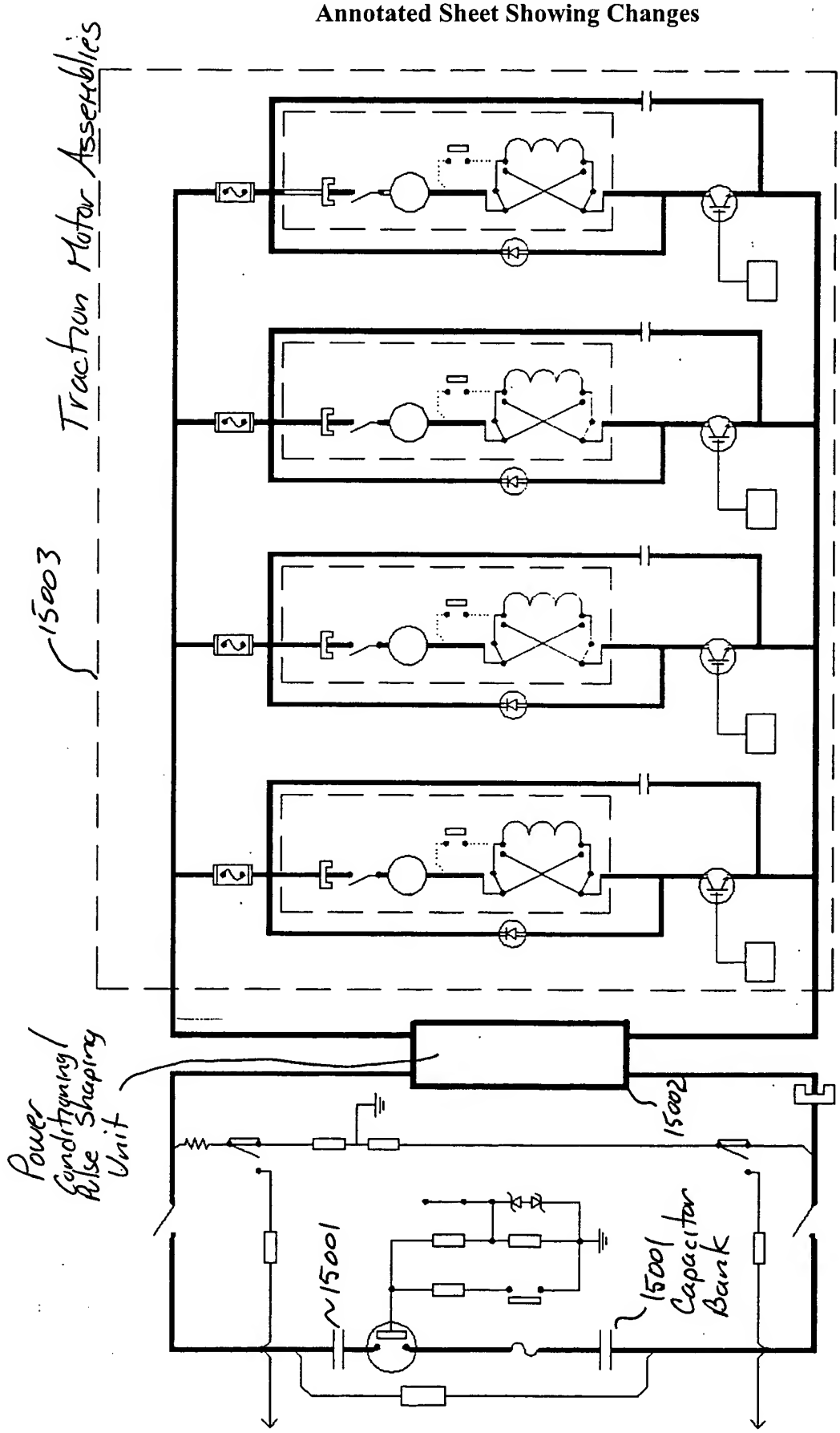

FIG. 15

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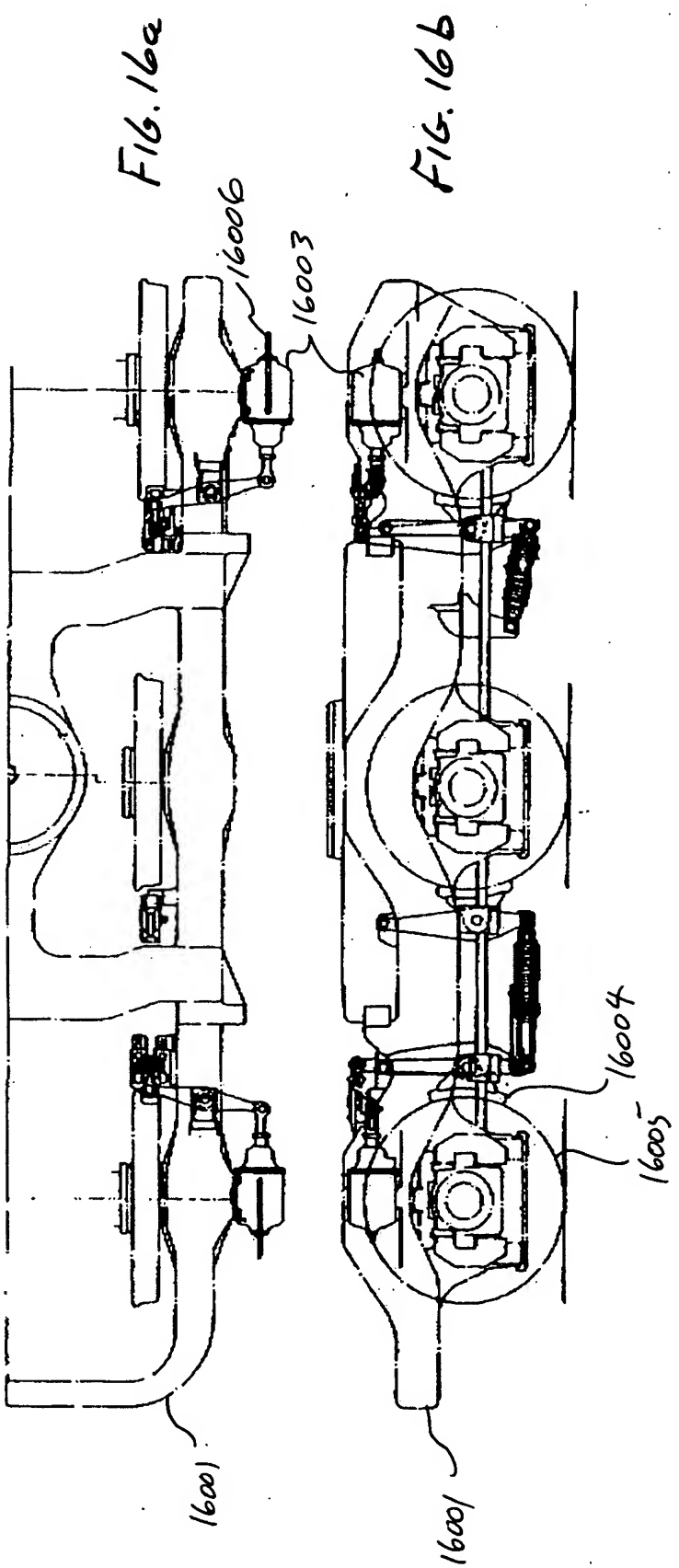

FIG. 16

Annotated Sheet Showing Changes

Drawing Enlarged

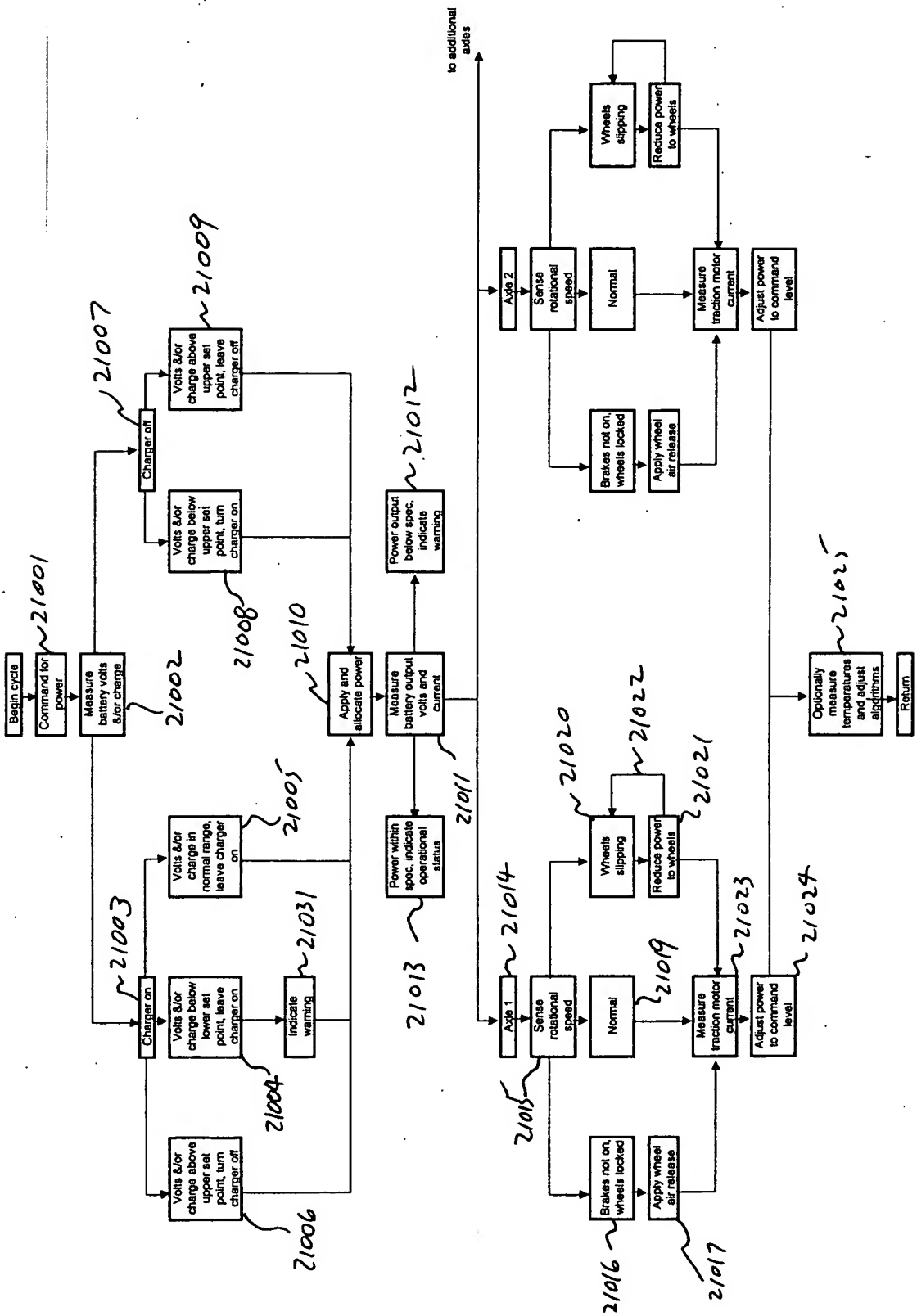

FIG. 21

Annotated Sheet Showing Changes

Drawing Enlarged

FIG. 22A

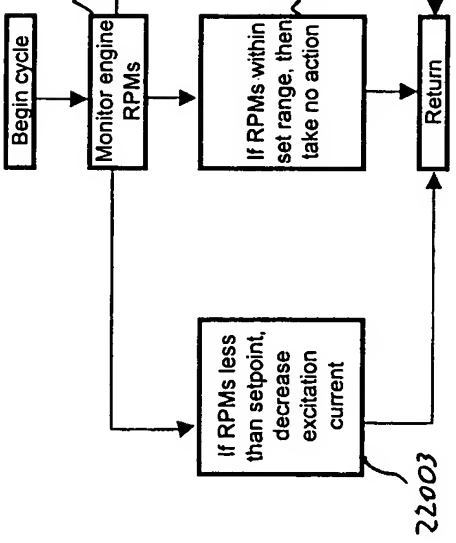

FIG. 22B

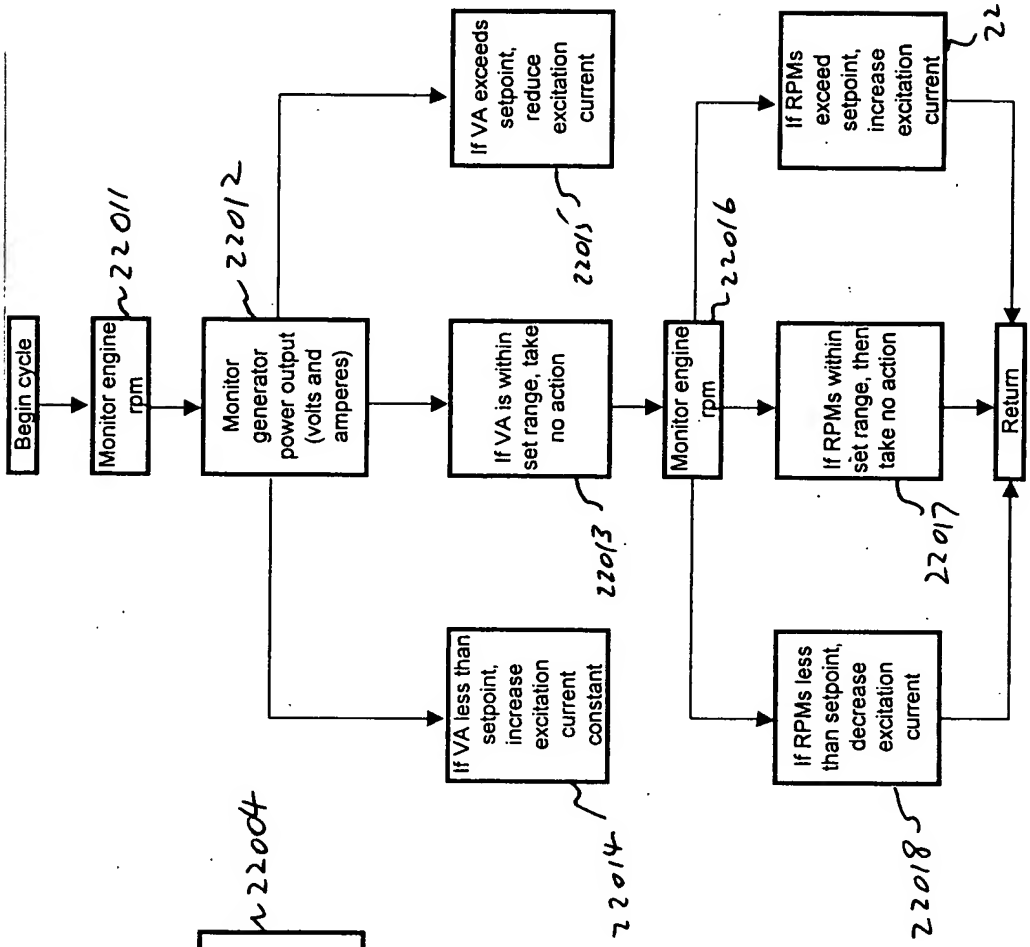

FIG. 22

Annotated Sheet Showing Changes

Drawing Enlarged

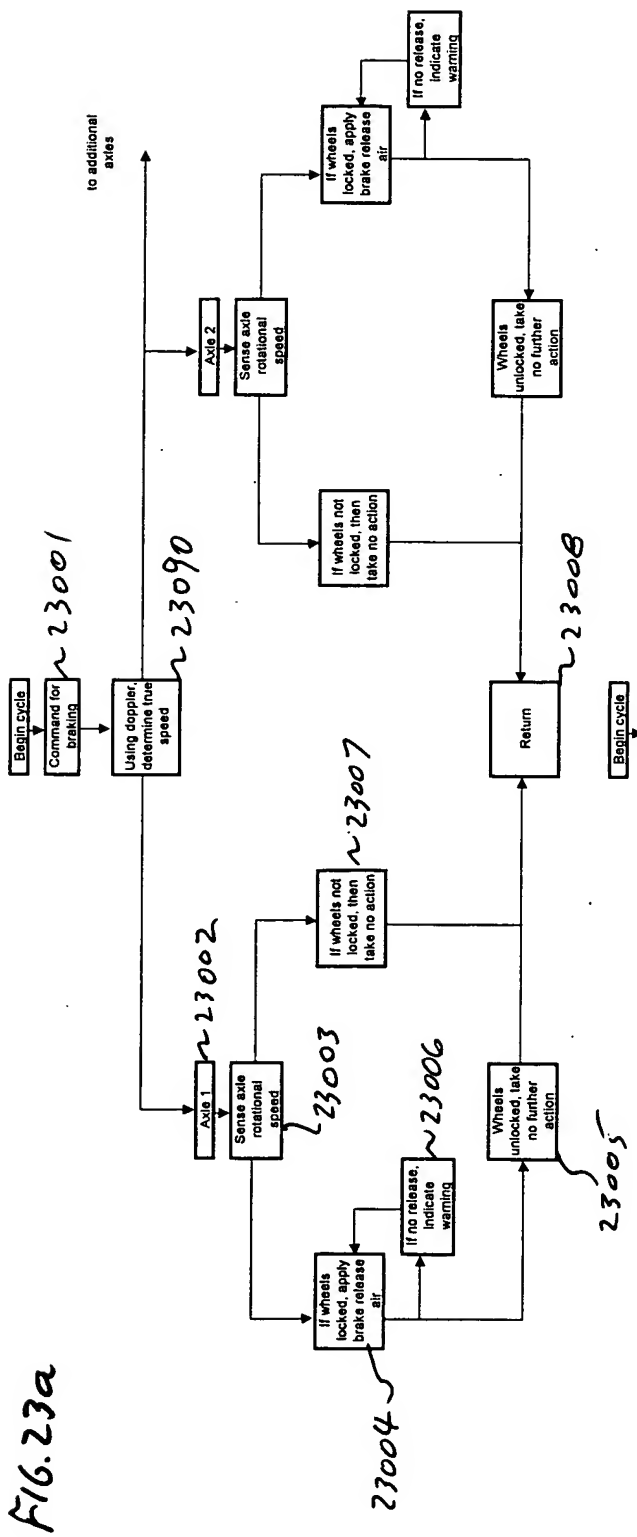

FIG. 23a

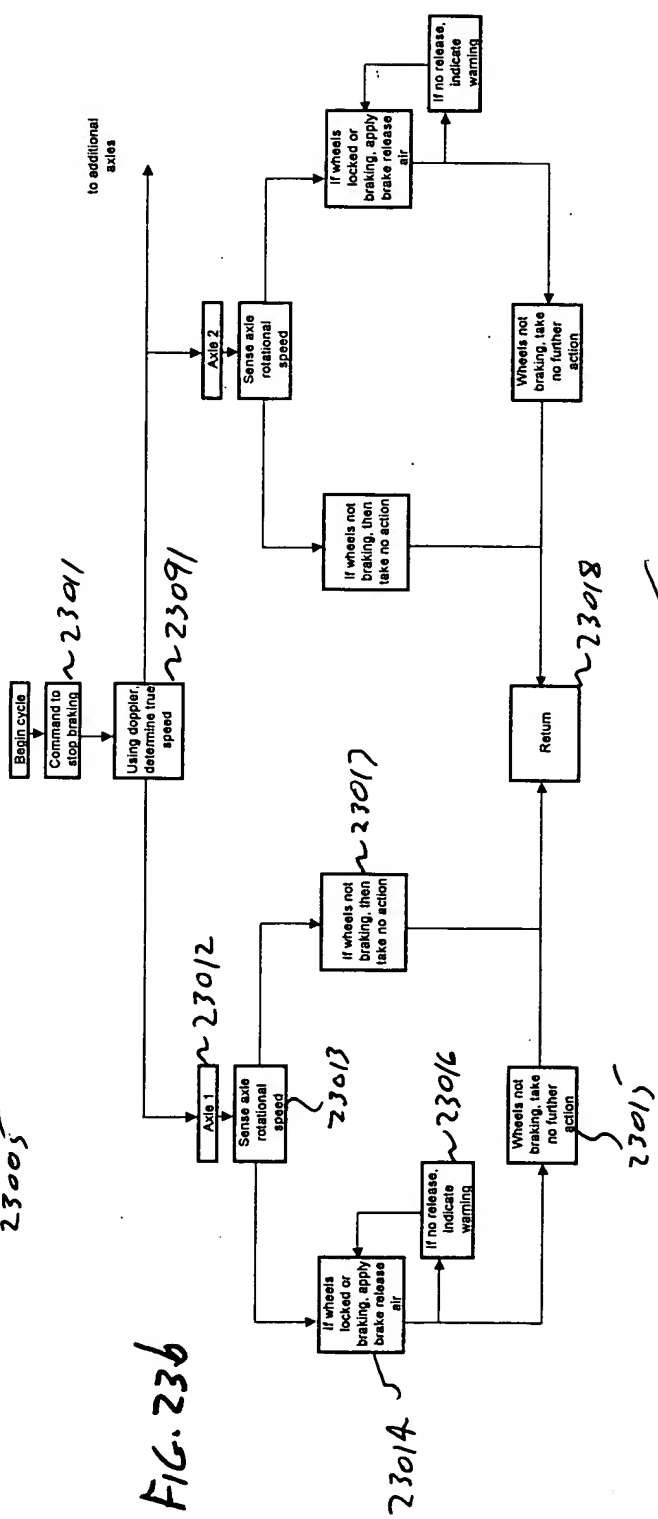

FIG. 23b

FIG. 23

Drawing Enlarged

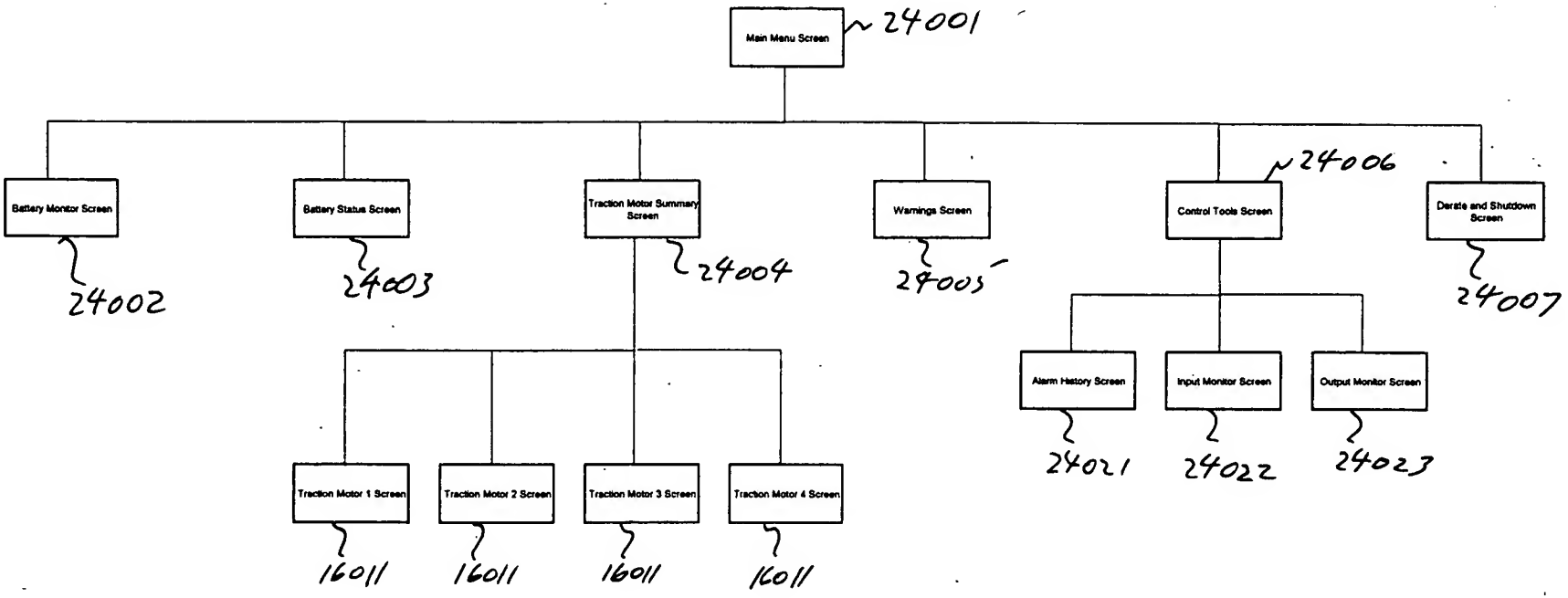

FIG. 24